BULLETIN No. 139.

DECEMBER, 1897.

PLANT LICE: DESCRIPTIONS, ENEMIES AND TREATMENT.

V. H. LOWE.

GENEVA, N. Y.
BOARD OF CONTROL.

GOVERNOR BLACK, Albany.
WILLIAM C. BARRY, Rochester, Monroe County.
S. H. HAMMOND, Geneva, Ontario Co.
MARTIN V. B. IVES, Potsdam, St. Lawrence Co.
A. C. CHASE, Syracuse, Onondaga Co.
F. O. CHAMBERLAIN, Canandaigua, Ontario Co.
F. C. SCHRAUB, Lowville, Lewis Co.
NICHOLAS HALLOCK, Queens, Queens Co.
LYMAN P. HAVILAND, Camden, Oneida Co.
G. HOWARD DAVISON, Millbrook, Dutchess Co.

OFFICERS OF THE BOARD.

MARTIN V. B. IVES, - - - President.
W. O'FANNON, - - - Secretary and Treasurer.

EXECUTIVE COMMITTEE.

S. H. HAMMOND, F. O. CHAMBERLAIN, LYMAN P. HAVILAND,
W. C. BARRY, F. C. SCHRAUB, G. HOWARD DAVISON.

STATION STAFF.

W. H. JORDAN, Sc. D., Director.
L. L. VANSLYKE, Ph. D., Chemist.
W. P. WHEELER, First Assistant.
S. A. BEACH, M. S., Horticulturist.
VICTOR H. LOWE, B. S., Entomologist.
*F. A. SIRRINE, M. S., Entomologist.
*F. C. STEWART, M. S., Mycologist.
FRANK H. HALL, B. S., Editor and Librarian.
GEO. W. CHURCHILL, Agriculturist and Sup't of Labor.

C. G. JENTER, Ph. C., Assistant Chemist.
WENDELL PADDOCK, B. S., Assistant Horticulturist.
†W. H. ANDREWS, B. S., Assistant Chemist.
J. A. LE CLERC, B. S., Assistant Chemist.
†A. D. COOK, PH. C., Assistant Chemist.
C. P. CLOSE, M. S., Assistant Horticulturist.
FRED D. FULLER, B. S., Assistant Chemist.
†E. B. HART, B. S., Assistant Chemist.
F. THOMPSON, B. S., Clerk and Stenographer.
FRANK E. NEWTON,

Address all correspondence, not to individual members of the staff, but to the NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.

The Bulletins published by the Station will be sent free to any farmer applying for them.

*Connected with Second Judicial Department Branch Station.
†Connected with Fertilizer Control.
BULLETIN No. 139.

PLANT LICE: DESCRIPTIONS, ENEMIES AND TREATMENT.

V. H. LOWE.

SUMMARY.

Plant lice are among the most important of the injurious insects. They may be found every year in the orchard and garden, but seldom in such numbers as during the past season.

Plant lice do not devour the tissue of the host plant but suck the sap by means of their tube-like mouth parts. They swarm upon the open leaf-buds and on the under surfaces of the leaves, causing them to curl and to become otherwise distorted. These insects multiply with great rapidity, but are held in check to a certain degree by numerous predaceous and parasitic insects. In most species the young are born alive during the spring and summer, eggs not being produced until fall.

As plant lice suck their food, Paris green and similar poisons cannot be depended upon when used in the ordinary manner. Some external irritant must be used instead. Numerous insecticides of this nature are recommended. One of the most important is good whale oil soap. Experiments during the past season show that 1 lb. of whale oil soap to 7 gals. of water will kill plum and currant lice. The solution should be applied in a fine spray to the under surface of the leaves. It is important that the work be done very thoroughly. The first application should be made as soon as the lice appear in the spring, which will be soon after the leaf buds open. A second or third application may be made as occasion demands.
INTRODUCTION.

Plant lice are among the most important of the injurious insects. They infest all kinds of fruits, vegetables and ornamental plants. Although present every year, some seasons are more favorable for their development than others. The past season has been one of this kind, and various species of plant lice have caused serious injury throughout the State, especially to orchard and bush fruits. The large number of inquiries received at the Station asking for information concerning the nature and habits of these insects, together with the best known methods of combating them, indicate the wide-spread injury caused by the lice and the need of information concerning them.

Plant lice are also among the most difficult insects to study. To work out all the details concerning the life history of any one species would, under ordinary circumstances, require more than a summer's work for a single individual. Observations on the species referred to in this bulletin were not begun, systematically, until last spring. The work is, therefore, necessarily incomplete; yet the existing circumstances are such that it seems best to publish a portion, at least, of the results thus far obtained.

PLANT LICE.

CLASSIFICATION.

Plant lice are true bugs. They belong to one of the largest and, from an economic standpoint, one of the most important orders of insects, namely the Hemiptera. The mouth parts of insects of this group are modified into beak-like tubes by means of which they suck their food. They are thus also classed with the suctorial feeders, as distinguished from those insects which masticate their food.

HOW PLANT LICE OBTAIN THEIR FOOD.

By carefully observing a plant louse when feeding, either from directly in front or from the side, it will be observed that the beak is extended so as to touch the surface of the
leaf, or is thrust slightly into it. The beak incloses the the thread-like mouth parts which the louse forces from the apex into the tissue, producing a wound which causes the sap to flow. This liquid food is pumped through the beak into the insect's body by means of suckorial muscles. Thus each plant louse is literally a minute pump which robs the host plant of a portion of its sustenance.

NATURE OF THE INJURY CAUSED BY PLANT-LICE.

Although all plant lice suck the sap of the host plant, the direct injury which they do may be manifest in different ways. Thus in some cases galls or pit-like depressions are formed on the parts attacked, as is the case with the woolly aphis and certain species which produce galls on the leaves. Most species, however, which attack the leaves of cultivated fruits, cause them to curl and, if the lice are very abundant, to wither and finally drop off.

An indirect injury caused by these insects is through the honey dew which they secrete. On badly infested trees the branches, leaves and fruit become coated with this sweet liquid which, in the process of drying, becomes sticky. This sticky coating soon turns black because of a black fungus which readily grows in it. Thus both the trees and fruit soon become unsightly and, not infrequently, the latter is made unfit for market.

LIFE HISTORY.

As the life history of these interesting insects is not usually well understood by those not especially interested in the study of insects, it may be well to state briefly the main points in their development. The life history of different species varies, but the following will serve as a general illustration.

If a colony of plant lice is examined in the late spring or early summer, it will be found to consist of winged and wingless females in all stages of development from the newly born larvae to the full grown individuals. The mature females give birth to living young with astonishing frequency. All of the young of these broods are females which mature
in an incredibly short time, giving birth, in turn, to female young at an equally rapid rate with their parents. Winged females are produced from time to time, apparently as occasion demands, for the dissemination of the species. These winged lice fly to other food plants or to other leaves on the same plant and start new colonies. This is continued during the summer. In many cases the lice migrate to new food plants for a portion of the summer. In the fall they may return to food plants of the same species as the original. These migratory broods consist of winged females. A generation of sexual forms, true males and females, is produced sometime during the fall. After pairing, each female produces one or more eggs. The eggs are usually placed on the twigs near the buds. They remain dormant all winter, hatching early in the spring into agamic females which, as they start the first broods of the season, are known as "stem mothers." It will be noticed that no male insects are produced throughout the season until fall. Reproduction is by a process known as budding. The following forms enter into the life cycle of a species during the season. The wingless and winged agamic female, the sexual female, the male, the winter egg and the "stem mother."

THE PRINCIPAL INSECTICIDES USED IN COMBATING PLANT-LICE.

These kill by contact. Internal poisons, such as Paris green and London purple, will not kill plant-lice when sprayed upon the leaves. The reason for this will be apparent when it is remembered that these insects suck the sap from beneath the surface of the leaf instead of devouring the leaf itself. The insecticides used for this purpose include kerosene emulsion, the kerosene-water mixture, whale-oil soap, tobacco in various forms, pyrethrum powder and hot water.

*Kerosene emulsion.*—This insecticide may be made after the following formula:

<table>
<thead>
<tr>
<th>Component</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1 gal.</td>
</tr>
<tr>
<td>Soap, whale oil soap preferred</td>
<td>½ lb.</td>
</tr>
<tr>
<td>Kerosene oil</td>
<td>2 gals.</td>
</tr>
</tbody>
</table>

Dissolve the soap in the water by heating to the boiling
point. When all the soap is dissolved remove from the fire and, while the solution is boiling hot, add the oil and agitate violently. This may be conveniently done by pumping the mixture through a small force pump. When sufficiently emulsified the mixture will have the appearance of milk. If allowed to cool it becomes thick like loppered milk. This is standard emulsion and may be diluted with water as desired. For ordinary use against such soft bodied insects as plant lice, 1 part of emulsion to from 10 to 15 parts of water is strong enough.

The kerosene-water mixture.—This is the simple mixture of kerosene and water without the use of soap or oil. The mixing is done in the pump and nozzles of the spraying outfits prepared especially for this purpose. The kerosene is held in one tank and the water in another. The pump draws from both tanks. The proportions of water and oil can be regulated at will.

The kerosene-water mixture has been used with good results against both plant-lice and scale insects. When applying the mixture to the foliage, care should be taken that injury to the tender leaves does not result from the separation of the oil and water.

Whale-oil or fish-oil soaps.—These soaps, when properly made, are among the most valuable of this class of insecticides. They may be made from any of the numerous fish oils on the market, but are usually sold under the name of whale-oil soap. The value of the soap as an insecticide lies, largely, in the caustic it contains.

Whale-oil soap was first used as an insecticide in this country nearly sixty years ago. It was recommended as a remedy for the rose bug and was used for this purpose at a strength of 1 lb. to 7½ gals. of water. The success which has attended its use against the San Jose scale in the east, has brought it into quite general use during the past few years. It now bids fair to take the place of kerosene emulsion.

One of the principal difficulties in the way of obtaining good results with the so called whale oil soaps, is the fact
that much of the soap of this nature sold on the market is of little or no value as an insecticide. Among the brands of whale-oil soap which have proven satisfactory in the hands of careful experimenters is that known as Good's Caustic Potash Whale Oil Soap No. 3, manufactured by James Good, 514-518 Hurst St., Philadelphia, Pa. Also Leggett and Brother's Anchor Brand whale oil soap, manufactured by Leggett and Brother, 301 Pearl St., New York. The price of strictly first class whale oil soap varies from 3½ to 4 cents per pound in wholesale quantities.

It is sometimes desirable to make the soap at home. According to Lodeman* a good fish-oil soap may be made after the following formula:

Crystal potash lye, 1 lb.;
Fish oil, 3 pts.;
Soft water, 3 gals.

"Dissolve the lye in the water, and when boiling add the oil and boil for two hours."

Tobacco.—As an insecticide tobacco has a wide range of usefulness. It may be used dry or in the form of a decoction. If used dry it should be finely powdered, the finer the better. Tobacco decoction may be made after the following formula:

Refuse tobacco, 1 lb.;
Water, 2 to 3 gals.

The mixture should boil for thirty minutes or more, or until a dark brown tea results. It should be kept covered until cool and may be sprayed, undiluted, upon the infested plants.

Concentrated extract of tobacco.—There are several preparations of this nature now on the market each of which is sold under a different name. A brand called "Nikoteen," manufactured by the Skabcura Dip Co., 99th St. & Torrence Avenue, Chicago, Ill., has been used at the Station with excellent results. This insecticide may be used either in the form of a vapor or as a spray. For use in the latter form against plant lice, 1 part nikoteen to 600 parts water is recommended.

Pyrethrum.—This is sold under the name of "Persian in-

---

*Spraying of Plants, p. 146.
PLATE II.—ENEMIES OF PLANT LICE.
PLATE III.—Hyalopterus pruni, Plant Louse of Plum.
(Fig. 4 reversed by engraver.)
PLATE IV.—PLANT LICE OF CURRANT.
sect powder" or "buhach." It is a valuable insecticide and is especially adapted for use against plant lice and similar insects. It is one of the most powerful contact poisons and may be applied pure or mixed with two or three times its own bulk of diluent. When used in this way it is especially adapted to small conservatories.

Pyrethrum has also been used with kerosene emulsion either as a kerosene extract or mixed directly with the emulsion.

*Hot water* has been successfully used against plant lice. Its use is considered practical only on a small scale. Most plants will not be injured by the application of water heated to 130° F. This treatment is fatal to the lice. Where practical, the whole plant may be dipped.

**EXPERIMENTS AGAINST PLANT LICE.**

**SPRAYING EXPERIMENTS WITH WHALE-OIL SOAP.**

These experiments were conducted in the Station plum orchard and in the garden on red currant bushes. The principal object of the experiments was to demonstrate whether whale-oil soap could be depended upon to check plant-lice when used as a spray, and thus avoid the necessity of preparing kerosene emulsion. Both the plum trees and currant bushes were badly infested, the former principally with *Hyalopterus pruni* and the latter with *Myzus ribis*. Both of these species are treated in detail on subsequent pages. The currants were sprayed first as follows:

On May 15, with a solution of whale-oil soap, 1 lb. to 10 gals. of water. Although much pains was taken to apply the spray so as to reach all of the lice, there was but little noticeable effect from the application.

On May 30 the currants were again sprayed but with a stronger solution of soap, 1 lb. to 7 gals. of water. The leaves were badly curled but by drenching them with the spray directed from below, most of the lice were reached. The effects of this application were soon apparent.

During the first week of June the bushes were sprayed
again with the same solution of whale-oil soap, with the effect that they were practically freed from the insects.

Had the first solution been stronger, two applications would probably have been sufficient. Two rows were left unsprayed with the result shown at Plate I. At the time the photograph was taken, in early June, but few leaves were left on the bushes as a result of the work of the lice. The treated rows showed much less injury from the insects.

The plum trees were not sprayed until June 4. They were badly infested at this time and the young leaves were so badly curled as to make it very difficult to reach all of the lice. The whale-oil soap solution, 1 lb. to 7 gals. of water, was used on all of the trees. The effects of this treatment were at once apparent. Practically all the lice were killed on the leaves which were not so badly curled as to prevent the spray from reaching the insects.

Before the trees were sprayed a second time, about a week later, some of the worst infested trees were trimmed. The tips of the branches having the most curled leaves were cut off. This removed large numbers of lice and left but little refuge for those that remained. The trees were again sprayed with the whale-oil soap solution, as in the first instance, immediately after being trimmed, with the result that, in a short time, but comparatively few live lice could be found.

RECOMMENDATIONS.

Do not wait for the leaves to become curled, but spray thoroughly as soon as the first few lice are observed. Much depends upon the thoroughness of the first application.

Direct the spray from below so as to drench the under surface of the leaves.

Use a solution of good whale-oil soap, not weaker than 1 lb. to 7 gals. of water.

When the spraying has been neglected until the leaves have become badly curled, trim off the curled tips and spray at once with the whale-oil soap solution. This applies especially to fruit trees.

In the case of currants and gooseberries, it will sometimes
be found practical to pick off and destroy the leaves which are first infested in the spring.

**NATURAL ENEMIES OF PLANT LICE.**

Plant lice are preyed upon by both predaceous and parasitic insects. These insects may be classed among those friendly to the farmer, because of the good they do by checking the increase of noxious species.

Among the most prominent of the predaceous insects which feed upon plant-lice are the lady-bird beetles. Both the larvæ and mature insects devour the lice. These insects will always be found where plant lice are abundant. The following are among the species observed during the past season:

**PREDACEOUS INSECTS.**

*Anatis ocellata* Linn. (*15-punctata* Oliv.).—This insect undoubtedly feeds on various species of plant lice. Although common on the currant bushes, the writer found it much more common during the past year upon the plum trees. During the latter part of May and until the middle of July, the insects could be found upon the trees in all stages of development. At Plate II, fig. 7, the larva is shown natural size and enlarged, the pupa at Fig. 8 and the mature insect, natural size, at Fig. 10. Fig. 9 is from a photograph of a plum with one of the pupæ attached. These pupæ do not seriously injure the fruit. The skin of the plum is not broken, as the larva, when about to pupate, attaches itself to the fruit merely by a gummy secretion from the tip of the abdomen.

There are a number of other species of lady-bird beetles which attack both plum and currant plant lice. The following are among those which were observed as being most common last season: The nine-spotted lady-bird beetle, *Coccinella 9-notata* Hbst.; the two-spotted lady-bird beetle, *Adalia bi-punctata* Linn.; a small reddish brown or brick red species having a black dot in each elytra; the ten-spotted lady-bird beetle, *Megilla maculata* DeG. This species is red with ten black spots on the elytra.
Plant lice are also preyed upon by syrphus fly larvae. A photograph of a common species, natural size, is shown at Plate II, fig. 11. The egg, attached near the base of an opening apple leaf bud, is also shown, enlarged to about four times natural size. These larvae suck the juices from the bodies of the plant lice, thus quickly causing their death. When full grown the larva forms an oblong green or brown puparium, larger at one end, and usually attached to the under surface of the leaf. In a few days a two-winged fly emerges. This is the mature insect which lays the egg.

Another species of syrphus-fly larva which has been much more common on the plum trees during the past season than the species referred to, is smaller and of a yellowish brown color. Specimens which appeared to be about full grown were measured July 20. The average dimensions were 2.4 mm. by 0.78 mm. Eggs were also found on this date. They were pearly white, oblong; slightly oval, rounded at each end and measured 0.87 mm. by 0.33 mm.; the shell brittle, and sculptured with heavy parallel, longitudinal lines of a dull white crossed by oblique parallel lines of the same shade. Every attempt to breed this species in the laboratory failed and neither pupae nor the mature insects were observed. The larvae were very abundant. From May until October a few of them could be found upon almost every infested leaf. Frequently they were entirely hidden from view by the large number of plant lice and the white powdery substance with which the lice are dusted so that the only indication of their presence was the brown, shriveled skins of the dead lice. It is probably within bounds to say that these larvae destroyed nearly forty per cent of the plum lice in the Station orchard last season.

There are still other kinds of insects which feed upon plant lice. Among them the most common are the aphids lions. These ferocious creatures are the larvae of delicate winged insects known as the lace-winged flies. The mature insects are very delicate and have finely veined green wings. The eggs are laid singly on the tips of stiff stalks of silk which are fastened to the leaf in an upright position. The stalks are
about half an inch high. When full grown the larva rolls itself into a little ball of white silk from which the mature insect finally emerges. These voracious larvae suck the juices from their victims, holding the plant louse or other prey at the tips of their long jaws and sucking the liquid by means of their peculiarly arranged mouth parts. A drawing of one of these larvae, greatly enlarged, is shown at Plate II, fig. 12. When about full grown a larva of this species measures about 4.4 mm.

PARASITIC INSECTS.

The work of these little insects was much more apparent upon the currant plant lice than upon those under observation on the plum trees. No parasites were reared from the latter.

_Aphidius polygonaphia_* Fitch.—This minute insect belongs to a large group of beneficial insects which are classified in the same order with the wild and tame bees, namely the _Hymenoptera_. This parasite seems to have a special liking for the currant plant louse, _Myzus ribis_, although it is a common parasite on other species. The egg of the parasite is laid on or just under the skin of the plant louse, and when this is once done the unfortunate louse is doomed. The egg soon hatches and the minute larva feeds upon the tissue just beneath the skin, taking care at first not to touch a vital organ. By the time it has become full grown, however, nothing remains of the host but the integument. The larva transforms to the pupa within its host, the mature insect cutting its way out. A parasitized plant louse soon becomes inactive, and swells up until it is somewhat larger than the largest of its fellows. The integument becomes hard, finally almost brittle, and turns pearly white. At Plate II, fig. 1, some of the parasitized lice are shown on the under surface of a currant leaf.

Although present during the entire time that the plant lice were common upon the currant, they were especially abundant during the latter part of May and the middle of June. June 17 the writer had a good opportunity to watch some of

*Identified by Mr. William Ashmead.
these minute parasites in the act of oviposition. They were flying or walking nervously about the infested leaves as if looking for just the right lice upon which to deposit their eggs. The female apparently selects a suitable part of the body of her victim upon which to place an egg, straightens her legs somewhat so as to raise her body, and brings the tip of the abdomen forward between them as far as necessary. In doing this the abdomen may be lengthened to twice its natural length and extended half its length or more beyond the head. The lice usually place the eggs upon the abdomen of the plant louse, but this is not always the case. Upon one occasion out of six parasites under observation, four placed the egg upon the abdomen, one upon the thorax and one upon the head. In all of these and many other cases under observation the plant lice upon which the eggs were laid were not more than half grown.

The time required for the eggs to hatch and the insect to mature was not observed. Both larvae and pupae were dissected out of parasitized lice. A drawing of the former greatly enlarged is shown at Plate II, fig. 4, of the latter at Fig. 5; and photographs of the mature insect at Figs. 2 and 3.

June 18 a number of the parasites hatched from specimens kept in the laboratory. In all the cases observed the developed parasite was on its back within the body of the louse with the head near the posterior extremity. When ready to emerge the imprisoned insect begins to cut through the walls of the abdomen with its jaws, cutting a round opening large enough to admit its body. As a rule the piece is not cut clear around, thus leaving a hinge as shown at Plate II, fig. 6. It takes but a very short time for the parasite to make its way to liberty, about four minutes being the time required for those under observation.

Other species bred from Myzus ribis by the writer are Isocratus vulgaris Walk. and Pachyneuron aphidivoros* Ashm. These species were not abundant.

*Identified by Mr. William Ashmead.
SPECIES OF PLANT LICE UNDER-OBSERVATION.

These include two, *Hyalopterus pruni* Fab., which has been very abundant on the plum during the past season causing serious injury to the trees, and *Myzus ribis*, which has been equally abundant and injurious on the currant.

ATTACKING THE PLUM.

*Hyalopterus pruni* Fab.

This species attacks the leaves of the plum, collecting in large numbers on the under surfaces. The lice multiply rapidly, becoming so thick as to cover the entire under surface of the leaves (Plate III, fig. 10) causing them to curl and wilt. Their bodies are covered with a bluish-white, mealy powder. Much injury was caused in both orchards and nurseries by these lice last season. In the Station orchard all of the varieties of plums were attacked during the time when the lice were naturally most numerous, but toward the latter part of the season but few could be found excepting on the native varieties.

*History and present distribution.*—So little attention has been given this insect by writers on economic entomology that it is difficult to learn its history. It is probably of European origin. It was first described by Fabricius who lived in the latter part of the seventeenth century. According to Bucton this species was also mentioned by several early European writers.

The insect is now known to occur in Germany, England, Australia and New Zealand and is probably distributed over a considerable portion of the eastern United States. It has been found as far west as Iowa. It occurs in abundance in the western part of this State.

*Food plants.*—The plum seems to be the principal food plant of this species. It is said to infest the leaves of the grape, peach, nectarine and apricot in Europe. It is known to migrate from the plum to a species of grass, *Phragmitis communis*. According to H. Osborne and F. A. Sirrine* it also infests the choke cherry.

---

Descriptions and notes on life history.—The writer's attention was first called to this species early in June. At this time most of the plum trees in the Station orchard were very badly infested with this and other species of plant lice. Most of the lice of this species were wingless and were present in all stages of development. Pupae and winged forms were much less numerous.

The larva.—The very young larva of average size measures about 0.5 mm. in length. The lateral margins of the body are nearly parallel, but the body is usually slightly broader near the posterior extremity. The general color is pale green with a slightly bluish tinge. The antennæ are 6-jointed. Joints I, II, are shorter and sub equal in length. Eyes red, legs stout, nectaries about as long as thick. The larvæ, like the mature lice, are covered with a bluish white powder. (Plate III, fig. 1.)

Apterus viviparous female.—Size of body 2.67 mm. by 0.99 mm. General color pale or yellowish green, with slightly darker green mottling. A medio-dorsal line of darker green, widest at about the middle, extends from the head to the cauda. Eyes dark reddish brown. All appendages nearly colorless or very light green, with the exception of the anterior half of the fifth and the entire sixth joints of the antennæ, the tips of the posterior tibiae and the tarsi, which are dusky. Rostrum reaches nearly to the second coxae. Antennæ slender, about two-thirds length of body. Joints III, IV and V sparsely tuberculated. Length 1.77 mm. Joints I, II and VI shortest (III, 0.45 mm.; IV, 0.3 mm.; V, 0.25 mm.; VI, 0.125 mm.; VII, 0.45 mm. Nectaries dusky; very short, 0.09 mm. in length, about half as broad, and slightly restricted at base. Legs slender, cauda prominent, slightly curved upward, 0.18 mm. in length by 0.12 mm. at base, tapering toward the tip and furnished on either side with two slender backward curved hairs. (Plate III, figs. 5 and 6.)

The apterous females were found on the native plums in the Station orchard until the latter part of September when only an occasional individual could be found.

Winged viviparous female.—Body more slender than apterous female. Size of body 2 mm. by 0.74 mm. General color the same as the apterous female. Head and prothorax usually somewhat darker green. Antennæ slender, slightly dusky with the exception of the basal third of the third joint which is pale green. Prothorax and thoracic lobes darker green. Apical third of femora and tibiae, entire tarsi and nectaries slightly dusky. Abdomen pale yellowish green with four to six triangular medio-dorsal green marks ranged transversely. Front of head not conical. Measurements of antennæ about the same as in ap'
terous female. Wings hyaline, expanse 6.9 mm., veins yellowish green; stigma narrow. Nectaries and cauda as in apterous viviparous female. (Plate III, figs. 3 and 4; pupa shown at fig. 2.)

The winged females were on the plums in more or less abundance during the entire summer. During the latter part of July, August and most of September but few winged females were found and most of these were on the native plums with colonies of young.

During the early part of September (Sept. 8) the lice were observed to be more abundant in the Station orchard. A few scattering colonies of winged females and young were found on all varieties of plums. These colonies evidently became more numerous toward the middle and latter part of the month. Oviparous females were first observed about the middle of October, and could occasionally be found on the trees until the first of December. The males were not positively identified. The first winter eggs were found November 11. They were on the twigs, most of them near the winter buds as shown at Plate III, fig. 9.

Oviparous female.—Body oblong, rounded above and tapering to posterior extremity. Size of body 1.33 mm. by 0.5 mm. General color pale green. A medio-dorsal line of darker green extends from the head to about two-thirds the entire length of the abdomen and two faint, green sub-dorsal lines close to the lateral margin, extend the entire length of the abdomen. Antennæ six jointed; length 0.72 mm. (III, 0.05 mm.; IV, 0.23 mm.; V, 0.05 mm.; VI, 0.22 mm.) Plate III, figs. 7 and 8.

Winter egg.—Color pale green at first, varying to darker shades. Measurements 0.6 mm. by 0.25 mm. Oblong oval in shape, slightly curved and obtusely rounded at the ends.

Partial bibliographical list.—
1892. Herbert Osborne and F. A. Sirrine. Insect Life,
Vol. V. p. 236. *Hyalopterus arundinis* Fab. (equals *pruni* Fab.) on plum and choke cherry.

*Other species attacking the plum.*—Six or more species are known to attack the plum. Among those observed by the writer last season are the following:

*Hyalopterus arundinis* Fab. This species closely resembles the preceding. According to Bucton it differs in both size and habits from *H. pruni*, being smaller and more active. Other structural differences are very slight, if any. The markings on the thorax are slightly different. This species was found closely associated with *H. pruni*.

*Aphis pruni* Fab. A common species on the plum. Numerous early in the season. Winged females (migratory brood) with young scattered through the Station orchard during the latter part of September and early in October.

*Phorodon humuli.* During August, September and October occasional individuals were found in the plum orchard. August 26 a few apterous and winged females with larvae were found on the plum leaves.

**ATTACKING THE CURRANT.**

*Myzus ribis* Linn.

This species is especially injurious to the red currant. The lice cause red bladder-like galls to form on the leaves. A badly infested leaf becomes greatly distorted and curled as the result of these gall formations, as shown at Plate IV, fig. 5. The degree to which the leaves are distorted by the lice seems to be influenced by the variety of currants. In the Station garden the leaves of Fay and Cherry currants were distorted by the lice much more than those of the London Red, although all three were infested equally and by the above species.

The injury caused by the lice was very apparent in the Station garden. The leaves dropped from the bushes, and the fruit was injured both by premature ripening and by the black fungus which grows in the honey dew secreted by the lice.

*Identified by Mr. Th. Pergande.*
History and present distribution.—This species is probably of European origin. It is widely distributed throughout the eastern part of the United States, occurring from Maine to Illinois and probably farther west. It is also well known in Canada.

Food plants.—Besides the red currant, it infests the black currant and gooseberry.

Descriptions and notes on life history.—The winter eggs hatch soon after the leaves open. Last year by May 13 the lice had become quite numerous on the currant bushes in the Station garden. The galls had just begun to form and some of them were tinged with red. Each of the galls was occupied usually by but one female with three or four young. The lice were multiplying very rapidly at this time and toward the latter part of May had become sufficiently abundant to do serious injury.

The apterous and winged viviparous females have been described by Bucton* as follows:

Apterous viviparous female.—Size of body 2.14 mm. by 1.01 mm.; length of antennae 2.27 mm.; length of cornicles 0.37 mm. Long oval, shining green, with darker green mottlings. Front flat, garnished with short bristles, as also are the sides. Antennae long and very fine. Cornicles cylindrical and pale green. Eyes bright red. Cauda obtuse. Legs yellow or greenish. Bristles capitate.

Winged viviparous female.—Expanse of wings 7.62 mm.; size of body 2.54 mm. by 1.13 mm.; length of antennae 2.27 mm.; length of cornicles 0.50 mm. Bright greenish yellow. Head pale olive. Eyes red. Three ocelli obvious. Antennae fixed on small tubercles. Prothorax with an indented olive band. Thoracic lobes brown. A stellate spot is seen on the post thorax, succeeded by six or seven irregular transverse bands on the abdomen of varying thickness; four or five spots on each lateral edge. Cornicles green or olive, cylindrical, or at least very slightly lavate. Legs green, with olive femoral points and tarsi. Wings broad with yellow insertions, greenish cubitus and veins.

During the latter part of July nearly all the lice disappeared from the currants and gooseberries. There still remained, however, an occasional apterous female on the old leaves.

These females could be occasionally found as long as the leaves remained on the bushes and were always accompanied by from two to four or five larvæ. They were very light green in color and about two thirds as large as the aperous viviparous females found earlier in the season. (Plate IV. fig 3.)

The male lice were first observed toward the latter part of October (Oct. 21.)

*The male.*—Size of body 1.15 mm. by 0.45 mm.; expanse 5.95 mm. Yellowish green. Head dark or olive green. Meso-thorax mottled with irregular dark green spots, and the abdomen with from three to six dark spots along the lateral dorsal margins, and a broad, broken transverse dorsal band of the same color on the posterior half.

Antennæ olive green, slender, 2.85 mm. in length (Joint III .65 mm.; IV, 0.4 mm.; V, 0.4 mm.; VI, 0.125 mm.; VII, 0.1 mm.) Third, fourth and fifth joints tuberculate. Sensoria very numerous. Eyes deep red. Legs yellowish green with the exception of the anterior third of the femora, tips of the tibiae and the tarsi, which are dusky. Nectaries yellowish green, cylindrical, slightly dilated, 0.22 mm. in length. Veins dark, stigma light yellow or yellowish green, 8 mm. in length.

(Described from one specimen in balsam) Plate IV, figs. 1 and 2.

The eggs are shining black. A few were found on the twigs during the latter part of October. They were much more numerous about a month later.

*Partial bibliographical list.—*

(*Rhopalosiphum ribis* Linn.) Descriptions. Ill. aperous and winged viviparous females.


1873. Riley, C. V. Sixth Missouri Report, p. 46.


1887. Oestlund, O. W. Synopsis of the Aphididae of Minn., p. 73 (Bul. No. 4 Geological and Natural History Survey of Minn.) Technical descriptions.


_Other species attacking the currant._—_Rhopalosiphum ribis*_ Linn. This species is especially common on the black currant.

It also attacks the red currant. The black currants in the Station garden were badly infested last season. During the latter part of July the lice left the currants. _Return migrants,_ (Plate IV, fig. 4**), appeared on the bushes early in October. The oviparous females and the males were first observed October 21, and the former were found until late in November.

Several females of this migratory brood were measured with the following results: Size of body 2.05 mm. by 1 mm. Expanse 8.9 mm.; length of antenna 2.95 mm.; cornicles 0.45 mm. The markings on the thorax and abdomen vary. In some instances the spots are more irregular and broken than shown in the figure. The lateral dorsal edges of the abdomen are also marked with small, irregular black spots.

_Oviparous female._—Size of body 1.6 mm. by 0.7 mm. General color dull or olive green. Tips of femora, tibia and the tarsi reddish brown. Antennae 1.9 mm. (Joint III 0.52 mm.; IV, 0.3 mm.; V, 0.25 mm.; VI, 0.1 mm.; VII, 0.6 mm.) Eyes red. Cornicles 0.45 mm.; dilated near middle, restricted at base, dusky on extreme tips. Cauda prominent, light green, 0.15 mm. in length. (Described from specimen in balsam.)

_Male._—Size of body 1.55 mm. by 0.85 mm. General color yellowish green. Head dark green or brown. Meso and meta thorax and abdomen mottled with darker brown or black. From three to four

---

*Identified by Mr. F. A. Sirrine.

**The anterior wings of this figure are not typical. Normally they are less angular on both anterior and posterior margins.
dark spots on lateral dorsal margins of abdomen. Eyes red, antennae on slightly raised tubercles. Length 3.05 mm. (Joint, III 0.75 mm; IV, 0.5 mm.; V, 0.4 mm.; VI, 0.15 mm.; VII, 0.95 mm.) Legs yellowish or light green with the exception of the anterior third of the femora, tips of tibiae and the tarsi, which are dark brown or black. Cornicles yellowish or light green, dilated, restricted at base, 0.45 mm. in length. Cauda same color as cornicles, 0.15 mm. in length, tapering, obtusely rounded at apex. (Described from specimen in balsam.)

The eggs are shining black and are placed on the twigs.

Several other species occasionally occur on the currant, but none of them were noticed during the past season in sufficient numbers to do serious injury.